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PEACE OR WAR WITH RUSSIA?

ROBERT M. HUTCHINS

Secretary Byrnes, on Thursday night, said that only a inexcusable tragedy of errors could bring about war between the United States and Russia. The Secretary might have added that this tragedy is now being played, and in a leading role are those who are deceiving themselves—and the country—about atomic energy. They would have us believe that we know a big secret about the atomic bomb; that, if we keep the secret, we shall be safe; and that we must put atomic energy under the control of the military in order to keep ourselves and our secret safe. This, they say, will not deprive us of goods, because peacetime applications of atomic energy are in the realm of speculation.

This argument is false in every particular. There is no secret of the atomic bomb. If we act as though there were, we shall be in the gravest danger; for we shall think we are protected by a secret, when, as a matter of fact, other nations can make atomic bombs in a very short time. And, if we put atomic energy under the control of the military on the ground that it is a weapon, and nothing but a weapon, mankind will lose enormous benefits which are available here and now.

Major General Leslie R. Groves, who supervised the Atomic Bomb Project, said last week that it would take the Russians a generation to make atomic bombs. It took us five and a half years, starting from scratch. The War Department, by publishing the Smyth report, has told the world everything we discovered in the first three years of our work, and much that we learned thereafter. So much has already been told that, if we gave other nations all our remaining "secrets", we would probably shorten their work by only about six months. The concensus of the scientists who made the bomb is that the Russians can make them in five years or less. Irving Langmuir, of the General Electric Company, a Nobel prize winner, and one of the few Americans who knows something about Russian science, says that the Russians may be able to produce atomic bombs in about three years, and that they may then make them at a far higher rate than we can. There are no less than twenty leading nuclear physicists in Russia, some of them recent importations from Germany; and in the 790 universities of the Soviet Union there must be many more whose fame has not yet reached the outside world.

The conclusion which General Groves announced last week was that atomic energy must be regarded primarily as a weapon until permanent peace is assured. Hence he insisted upon military control. General Groves is wrong either way. If atomic energy is not primarily a weapon, then it should not be under military control. If it is primarily a weapon, it should not be under military control either, for it is a weapon of such vital international importance that, like our international relations, it should be under civilian control. We cannot allow the military to decide our fate. If atomic energy is primarily a weapon, it will be made a better weapon if the scientists who work on it do not have to work under military secrecy and are free to exchange ideas with the scientists of other countries. If there had not been such exchange before the war, we never would have been able to make the bomb. The leading ideas all came from abroad; and Germany, Italy, England, France, Hungary, Denmark, and Canada were all prominently represented in the development of the bomb. Without the free exchange of basic scientific information America will drop behind other nations in atomic energy, and, if atomic energy is primarily a weapon, other nations will shortly have better weapons than we.

But General Groves is wrong in saying that atomic energy must be regarded primarily as a weapon until permanent peace is assured. He might just as well have said that we must regard the aeroplane primarily as a weapon until permanent peace is assured, for we must have secrets in aviation as important as any we have left in atomic energy. Suppose we did regard the aeroplane primarily as a weapon until permanent peace was assured. The result would be that air transportation and aviation research would come under the domination of the military and that our people would be robbed of the advantages which progress in the air could give them. And what is much more serious, we would be proclaiming the start of an armament race in aviation which would mean that we must abandon hope of permanent peace.

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MOMENTOUS DECISION

Senate Committee Prepares Domestic Bill

After listening for four months to scientists, statemen, industrialists and the military, the Senate Committee on Atomic Energy has retired into executive session. In the next two weeks, it expects to report to the floor a bill on domestic control of atomic energy.

The scientists have hoped that extensive hearings would awaken both the legislators and the American people to the utter futility of old-fashioned concepts of military security in the world of atomic weapons and to the desperate necessity for an entirely new departure in international relations.

These hopes have not materialized. The collected testimonies before the McMahon Committee make exciting reading; but the American people have taken hardly any notice of them. It has been too preoccupied with strikes, demobilization, and reconversion troubles. Press and radio have done little to attract attention to the preview of much greater disasters unrolled before the Senate Committee.

In the Committee itself, two of the most influential members—Vandenberg and Connally—have been absent most of the time. Several others have been only in irregular and silent attendance. The questioning has been largely monopolized by a senator whose final attitude is epitomized by his suggestion "why not lock the whole thing up."

As the Committee begins its legislative task, it has before it the McMahon bill, endorsed by a vast majority of scientists in the country, by most industrial witnesses, by President Truman and by the Secretaries Ickes and Wallace. The Secretaries of the Navy and of the Army, Forrestal and Patterson, also have testified for the bill, but have asked for some amendments.

Secretary Patterson expressed himself in favor of civilian control of atomic energy. He endorsed a full-time, three-man Atomic Energy Commission, and the principle of free publication of scientific results. In his opinion, the Army is not competent to draw the line between basic scientific research and military techniques which should be

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PEACE OR WAR WITH RUSSIA? - - - Robert M. Hutchins

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Similar results will flow from holding that atomic energy must be regarded primarily as a weapon until permanent peace is assured. This great discovery, comparable in importance with the discovery of fire, will be kept under military domination. The people will be robbed of the advantages which progress in this field can give them. And we shall proclaim an armament race in atomic weapons which will end all hope of peace.

An armament race in atomic weapons will end all hope for civilization. Caution requires us to accept Mr. Langmuir's estimate that the Russians may be producing atomic bombs in about three years and that they may then produce them at a far higher rate than we can. Unless we intend to go to war this minute, therefore, we must assume that in the next war both sides will have atomic bombs. There is no defense against the atomic bomb. Hence nobody can win the next war. The cities of both sides will be destroyed. Five hundred bombs of the kind we dropped on Japan can wipe out all the cities of the United States; and General MacArthur is reported to have said that we now have bombs one thousand times more powerful than those which devoured Hiroshima and Nagasaki. If we now have such bombs, we can be sure that other countries will shortly have them, too. But it is not necessary for them to have them; for one bomb of the kind we had last August is enough to destroy a city the size of Indianapolis.

There is no defense against the atomic bomb. One aeroplane can destroy a city, even if ninety-nine are shot down. The British could find no defense against the V-2 bomb; the only way they could defend themselves against it was to win the war. If the V-2's had had atomic warheads, England would have been erased; it would have had no time to win the war. The atomic bomb can be smuggled into a country by agents in peace-time, planted in a convenient location, and detonated at a convenient time. There is no way of detecting an atomic bomb underground, or in a box, which could have the size and appearance of a box for the overseas shipment of a typewriter. The atomic bomb makes possible anonymous war. Since the agent who plants it will not leave his calling card, we may be unable to tell whose agent he was.

The atomic bomb is a revolution in warfare. During the last war incendiaries and other conventional bombs destroyed whole areas, but the resulting casualties, square mile for square mile, were only fifteen percent of those caused by the atomic bomb. Evacuation and rescue work proceeded after the raids on Tokyo, but not after the atomic bomb fell at Hiroshima. At Hiroshima, where a quarter of a million people were killed or injured by one bomb in one minute, there were, before the bomb dropped, thirty-three modern fire stations. Twenty-seven of them were destroyed. Three-fourths of the firemen were casualties. The medical officer in charge of public health was killed; his assistant was killed, and **his** assistant. The commanding general was killed, and his aide, and his aide's aide, and his entire staff. Of 298 doctors only thirty were able to care for the injured. Of 2400 nurses and orderlies only 600 could work. Every hospital but one was so damaged as to be useless in the emergency. And this was the result of one bomb, and one bomb that was old-fashioned and out-moded by the time we dropped a bigger and better one on Nagasaki.

Are we going to start an armament race in weapons of this sort when we know that there is no defense against them? It is doubtful wisdom to start a race of any kind unless you think you have a chance of winning it. But an armament race in atomic weapons is one everybody must lose. To start such a race is madness. And it is cowardly as well. It is like a man who prefers to blow himself up along with his neighbors rather than make the effort to procure a peaceful settlement of their quarrels. The alternatives before us now are suicide or peace. Those who now indulge in loose talk about settling international differences by force must realize that force means war. War means atomic bombs. And atomic bombs mean suicide.

Atomic energy could bring untold blessings to us and to all future generations. The use of atomic energy for heat, light, and power on a large scale can be easily demonstrated in a very few months. When atomic power is available, distance and the scarcity of fuel will cease to influence the location of industries and communities. New industries and new communities, which, by the way, can be free from smoke, can be created anywhere because the cost of transporting the materials from which we draw atomic energy is negligible. This tremendous new force can bring unheard of new leisure to toiling humanity everywhere. To the biologist and the doctor the discovery of atomic energy is as important as the invention of the microscope. Radium has been a scarce and expensive medical tool. The waste from the Hanford atomic bomb plant alone contains enough radioactive material to make it unnecessary ever to worry about radium again. Radioactive carbon and radioactive iodine are ready to revolutionize important areas of medicine and biology. The radioactive products of nuclear fission will give us new methods of diagnosis and therapy and new industries for the manufacture and distribution of the materials.

These are not dreams; they are realities. New industries, new communities, more leisure, better health, and longer life—these are among the blessings which atomic energy puts within our grasp. Think what atomic energy offers to the veteran looking for new opportunities; to labor, looking for more jobs and greater production; to the farmer, looking for new markets and a little leisure. It offers a higher standard of living for all the world.

To get these things we need the freest possible research and development, conducted in the public interest, under civilian control. But the prime requirement is peace. Taking atomic energy away from the military would help us to get peace, for it would show that our intentions are peaceful. At the same time, it would in no way endanger our security. We should stop swaggering and rattling our atomic bombs. Other nations will have them soon. We must remember that an atomic war is a war nobody can win. In a world full of atomic bombs the settlement of international disputes by force means that two-thirds of the populations involved will be killed. Since disputes cannot be settled by force, they must be settled by agreement or by law. We must therefore do everything we can to promote international understanding, through the exchange of ideas, of scientists, of professors, and of students. We must do everything we can to create a sense of community in the world. We must strengthen every agency of international co-operation, especially the United Nations Organization. But, realizing that no agency of international cooperation can prevent war, we must at the same time work and plan for a world government and a world state, which offer the only real hope of saving civilization in the atomic age.

NOTES ON OUR CONTRIBUTORS

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SECRECY IN SCIENCE . . .

Louis N. Ridenour

There seems to be universal agreement that it is wise and useful to permit and even encourage full and free publication of all the results and findings of basic scientific work, **provided** that this is not done on a unilateral basis and that other nations will trade their scientific results for ours. However, some have either implied or stated explicitly that it would not be wise for us to maintain a policy of free publication of basic scientific work if some other nations refuse to do likewise. I shall try to show that the interests of our nation will in any case better be served by complete freedom of publication of the results of scientific work than by attempting to restrict the circulation of such information to a certain group in this country, in order to prevent its leakage to foreign nations who might be our enemies in a future war. In my opinion, this is true even if no other nation in the world has a policy of free publication of scientific results. It is true whether we think that we have entered an era of international peace, or believe reluctantly that we must prepare ourselves for inevitable war.

It is easy to make an idealistic argument for freedom of scientific publication: to say that the publication of results is the lifeblood of science, to assert that only by demonstrating our international good faith by a policy of free publication can we hope to set the stage for international trust and understanding. I shall not make such arguments. I shall confine my remarks to the desirability of freedom of scientific publication in an era of international suspicion, during an armaments race, and even in the midst of a war.

MAN-MADE SECRETS

C. F. Kettering has said: "When you lock the laboratory door, you lock out more than you lock in." In the radar field, we started with the same atmosphere of secrecy, the same precautions about compartmentation of information and clearance of individuals, which characterized the atomic bomb project right to the end, and still characterize it today. However, we did away with most secrecy before the end of the war. At the end of the war, the Army was publishing a magazine on radar with a circulation of over 12,000. It had become apparent that secrecy cost us in efficiency far more than it gained us by keeping the enemy in ignorance.

The use of the word "secret" for the results of scientific investigation or the findings of engineering is genuinely misleading. Let me illustrate what I mean. If I say, "I am thinking of a number, but I shall keep it a secret," I have used the word "secret" in its usual sense. Apart from the possibility of my telling of the number, you have no way of finding out what it is. On the other hand, if I say, "I know the critical mass of U-235 necessary to make a bomb, and I intend to keep it secret," I am using the word "secret" in a very different sense. I am saying to you, not that you cannot find out what I know, but that you must find it out for yourself, without my help. This may cause you to become annoyed with me, but it cannot keep you in ignorance.

In order to be sure that I am keeping such knowledge from you, I must also keep it from most of my own people. Since it is never known, in science, which man will have a new idea, or what each man must know in order to have ideas and do the work of which he is capable, I am hobbling my own work by my belief in the usefulness of scientific "secrecy."

SIMULTANEOUS DISCOVERIES

Scientific history is full of coincidences—of cases in which two or more men, in different parts of the world, have reached the same result independently of one another's work and at the same time. Dr. A. H. Compton, an outstanding figure in the work on the atomic bomb, was awarded the 1927 Nobel Prize in physics for his dicovery of what is now called the Compton effect —the inelastic scattering of quanta by free electrons. In Holland, this is called the Debye effect, because Compton's explanation of his experiments was given independently by Debye at the very same time.

The Russian physicist Gamow, and Gurney and Condon, (who is scientific adviser to the Senate committee on Atomic Energy), gave independently and at the same time an explanation of the phenomenon of alpha-disintegration of the radio-active elements. The hypothesis of a violent splitting of the uranium nucleus based on the work of Hahn and Strassman in Germany was independently proposed and verified by Frisch in Copenhagen and by Joliot in Paris. The suggestion that plutonium would be a suitable explosive for an atomic bomb was made in this country by L. A. Turner. The Smyth report points out that the same idea occured independently to the British physicist Cockcroft, and Turner has told me that von Halban, working in France, had the same idea at the same time.

Two promising new devices for the acceleration of electrons and atomic nuclei to high energies were invented last fall by two young American scientists. One, called the synchrotron, was invented by McMillan, at Berkeley; another, the microtron, by Schwinger, at Harvard. In the summer, 1945, issue of the Journal of Physics of the USSR, a Russian physicist named Veksler published a paper describing both these devices. Actually, one of them was first suggested by Veksler already in 1943. Though the scientific shades had been down between Russia and the United States during the war, after five years Russians and Americans were doing the same thing, in the same way, at the same time. The synchrotron involves a magnet, whose design is straightforward but complicated. McMillan is presently building a synchrotron, on funds supplied by the Manhattan District. When a physicist at M.I.T., who is also planning the construction of such a device asked McMillan for his magnet design, he was told that the Army would not permit the release of information on the magnet. Whom are we attempting to handicap by such restrictions? Surely not the Russians; they not only invented the synchrotron, they did it earlier than we did.

In my own wartime field of radar there were many examples of the same kind. Radar itself was independently invented by the Germans, the French, the British, the Japanese, and ourselves. Each of the nations kept it secret from all of the others, not knowing to what little point this was done. Microwave radar, which has played such a great role in the Allied victory, was made possible by a single invention, the cavity magnetron. This is a transmitting tube which gives previously unimaginable amounts of power on wavelengths far shorter than those available to radio engineers before the war. It was invented by the British. When the British sent a scientific mission over to this country in the late summer of 1940, one of the most impressive and persuasive of the secrets they had to show us was the cavity magnetron. When the Radiation Laboratory was first set up, an attempt was actually made to keep knowledge of the magnetron localized in one group of the laboratory, not even letting the men who were working on a modulator to energize this tube know of the tube's design. Yet all this time there was in the Russian literature a paper which exactly described the cavity magnetron, and gave the results of experiments with it.

WHAT IS BASIC SCIENTIFIC INFORMATION?

In the light of all this evidence, and more which I could quote for hours, one must forgive scientists for being impatient with talk of "the secret of the atomic bomb." Today, more than eight months after the explosion over Hiroshima, the entire non-secret literature covering the immense amount of medical work on the effects of radiation and of radioactive poisons on living organisms is to be found in Section 8.70 of the Smyth report. Quoted in its entirety, it is: "Extensive and valuable results were obtained." Even in an armaments race

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ATOMIC ENERGY CONTROLS No. 5 - Control of Mineral Production

In issue No. 4 of this Bulletin, we listed the groups studying the technical aspects of international control of atomic energy. One of these, the Committee on Atomic Energy of the Carnegie Endowment for International Peace, has now released a report of a subcommittee on "Inspection of Radioactive Mineral Production." This type of inspection has already been discussed in two articles in this Bulletin (No. 2 and 5). The report of the Carnegie Endowment Committee gives authoritative support to the point of view of the previous articles.

The committee which wrote the report consisted of Chairman, Prof. Paul F. Kerr (President of the Mineralogical Society of America, and Chairman of the Department of Geology at Columbia University); three representatives from American Institute of Mining and Metallurgical Engineers; Anton Gray (Chief Geologist, Kennecott Copper Corporation), Walter P. Jacob (former President, General Bronze Corporation), and John E. Norton (Mining Engineer, Anaconda Copper Mining Corporation), and two representatives from Geological Society of America: A. F. Buddington (Chairman, Department of Geology, Princeton University) and Adolph Knopf (Professor of Geology, Yale University).

Following is a condensation of the findings:

PROBLEM BEFORE THE COMMITTEE

A survey of the problem has led to the conclusion that two key elements, uranium and thorium, should be under inspection.

In the Smyth Report it is stated that the amount of U235 in a bomb lies somewhere between 2 and 100 kilograms. Routine computation indicates that at least 700 pounds of even the most concentrated uranium raw material would be required to furnish 2 kilograms of U235. To furnish 100 kilograms of U235 would require about 16 tons.

A cut-off limit far below the amount necesssary for the smallest bomb has been applied in this country during the war. The War Production Board has required a report each month from any person having in his possession or control 2,000 pounds or more of any ores, residues, or tailings containing 0.05 per cent by weight of uranium as uranium oxide. This corresponds to 1 pound of uranium oxide distributed through a ton of rock.

For purposes of international inspection, geological occurrences, specimens, samples, prospects and mines, as well as ores, residues or tailings should be reported that contain uranium or thorium sufficient to yield 1 kilogram of either element in one month.

The limit brings within the range of inspection small prospects in which an occasional specimen of rich pitchblende or some other uranium mineral may be found. It includes a possible few pounds per month or more which might be produced as a by-product from some large metal mine.

The amount of uranium required for pre-war commercial purposes is negligible in contrast to uranium consumption for the atomic bomb.

The use of uranium could be discontinued where suitable substitutions may be made. Where this is undesirable the element could be distributed in small quantities under license and inspection.

The amount of thorium required for ordinary commercial purposes is large enough to require special consideration with suitable licensing and control provisions.

AUTHORITY OF INSPECTORS

Rights and privileges granted to the United Nations inspection commission should include:

1. Access to all uranium and thorium mines for the purpose of establishing the uranium and thorium content, surveying reserve and controlling production.
2. Authority to inspect terrain adjacent to producing mines and to make geological surveys for radioactive elements.
3. The right to travel without hindrance.
4. Access to air fields for the purpose of inspection flights.
5. The right to photograph from the air and to maintain laboratory facilities for studying aerial photographs.
6. The right to maintain international guards at key points.
7. Authority for geological inspection and survey of terrain in which uranium or thorium prospects occur or may be suspected.
8. The right to maintain assay and mineralogical laboratories.

At the same time the authority carries with it the responsibility not to reveal the information obtained outside the inspection commission.

Inspection groups will inspire more confidence should they comprise representatives of several nations.

Although few centers of uranium and thorium mining now exist, in order to be thoroughly effective inspection should apply to all of the countries in the world. While the discovery of uranium or thorium in some countries is extremely improbable, it is impossible to predict that any single country will not inquire inspection.

INSPECTION AT KNOWN MINES

Inspection recommended for uranium or thorium mines now in production would follow the normal pattern ordinarily utilized in the control of mining operations.

1. A competent engineer should be assigned to be in charge of inspection at each producing mine.
2. A completely independent and reliable assaying and sampling department should be under the control of the engineer.
3. A guard or several guards, if necessary, should be available to see that the engineering and assaying equipment function without hampering, also to guard accumulated concentrates and materials in transit.
4. A geologist and surveyor should be assigned to the engineer as required.
5. A regional geologist should be authorized to operate independently in order to supplement the engineering phases of inspection.

The engineer in charge of the inspection of any mine should be charged with obtaining and verifying all information concerning the property necessary to enable him to determine not only the present production of radioactive minerals, but the probable productive capacity of the deposit. The governments participating in the control or the managements of individual properties shall furnish all maps and records necessary to supply the required information.

The preparation of regional geological maps by the geologist assigned to the inspection personnel, covering the terrain surrounding the producing deposit, would be of distinct benefit in establishing the limits of control in a district. Aerial surveys, photographs and maps are to be considered an essential part of such a program. The character and radioactive mineral contest of all nearby rock exposures should be established. It should be the objective of the control engineer to know fully as much about the productive capacity of the mine and surrounding region as the operators.

It is probable that a group of less than 200 of the type just described, distributed among uranium mines now producing, would be adequate to completely handle the control situation at the known centers of production.

BY-PRODUCT INSPECTION

A few pounds per ton of uranium or thorium bearing raw material found as a by-product in a mine of small production would be of little significance, but in a mine handling many thousands of tons of ore a day it might assume great importance.

The detection of small amounts of radioactive elements in the ore from any large mine is feasible from the standpoint of inspection. The inspection does not need to be continuous, but for pur-

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CONGRESSIONAL NEWS . . .

GENERAL GROVES PRESENTS HIS VIEWS TO SENATE COMMITTEE

Having testified twice before — once in open session and once in executive session — General Groves appeared for the third time before the Senate Committee on February 27 to give his views on the atomic energy bill. They proved to be in opposition to those of President Truman and of the Secretaries Wallace, Ickes, and Patterson.

He began by asserting that "he has no more personal interest in proposed legislation than any other citizen should have." Later in the testimony he stated that after "the experiences of the last five months" "it would take very strong urging" to make him accept (the post of the administrator). "It would not be enough to tell me we would like to have you." He acknowledged that "during the war, I was both the Administration and the Commission," but later described the war-time Military Policy Committee (Bush, Conant, General Styer, Admiral Purnell) as a pattern for the future Atomic Energy Commission.

In presenting arguments in favor of a part-time, nine-men Commission, he said that "that is not a War Department position at this time." Asked what the War Departments position was, he answered "I don't know what it is. They have sent to the Bureau of the Budget a report, I believe, on the McMahon bill. I have glanced at that report; and I did not prepare it." Asked whether Sec'y Patterson's testimony represents the official War Department's position, General Groves answered, "yes, until it is changed."

Discussing the qualifications of the members of a nine-men Commission, General Groves said that scientific representatives should not be nuclear physicists, or come from universities or colleges having nuclear physics laboratories, since these are not "disinterested." "Such men as Presidents Conant of Harvard and Compton of MIT are automatically barred in my opinion, because their institutions are vitally interested in nuclear physics research, although they personally would be ideal members."

One should get from colleges "such as Williams or Amherst men who had taught science and then had become president of small colleges." He singled out Dr. Bush as a scientist who could be member of the Commission "without interference with other interests."

In the same spirit, General Groves would choose industrial representatives on the Commission from companies not interested in atomic energy. "This would bar any man who was an executive in General Electric or Westinghouse."

He suggested that the Armed Services should be represented on the Commission by 2-4 men, "either in active service or on the retired list," coming from various branches (Army, Navy, Air Force). He would not consider "a civilian head of the War Department," or "a man who has to go to the Secretary of War or the Chief of Staff to be told how to vote" an appropriate representative for the Services. "I want a man who is not going to forget for a minute that as long as this is the prime military weapon of the country, defense must come first and other things afterwards."

He agreed with Senator Millikin that there is "nothing on the horizon" to make him believe that the military aspect of atomic energy will lose its predominant importance in the next few years. He volunteered in the same breath, the opinion that he "sees nothing that might result in a defense" against the bomb.

General Groves saw no contradiction between his previous statements that "the Army wants to get out of this just as quickly as possible" and his present attitude. He thinks a Committee with a 5:2 or even 5:4 ratio of civilians and military (and an army man as administrator) will be "predominantly civilian." He said "he doesn't recall" having discussed with Gen. Eisenhower the latter's desire for a fully civilian Commission.

He conceded to Sen. Vandenberg that the military representatives on the Commission will have to "sever themselves from the Army" and admitted that this is difficult to reconcile with his suggestion that these representatives should be active officers, serving only part-time on the Commission.

Discussing alternative suggestions for the Commission, General Groves said he "doesn't believe in ex-officio members who are busy heads of departments." Of a three-man full-time Commission, he said "if you have one man with military experience, and one with industrial and one with academic science," that leaves out "more than one military man, who would either have to be air, ground, or sea." Prompted by Sen. Johnson, he added that "it would leave out an Army Engineer."

General Groves then described the way in which he was advised by the Military Policy Committee in the past: "Styer and Purnell could handle the military part of it, Bush and Conant could handle the scientific part. If a chemical problem came up, Conant's advice was always followed." The same was true with Bush's advice on electrical problems. "That is the type of men I would like to see on the Commission."

He conceded that the Policy Committee met only "at irregular intervals—between one and two and one-half months apart," but insisted that they were kept informed and policy decisions "such as building three piles and two separation plants at Hanford" were approved in advance. He recalled that on one occasion he "was overruled by the Policy Committee on a matter of organization."

General Groves then said that "if a bill is adopted which has no military on the commission, the latter should be directed to submit to the Joint Chief of Staff all matters of policy." If they do not concur, these matters should be submitted to the President. The bill should also provide "continuous consultation with the War Department on all matters of security, military research and development, manufacture, storage and use of bombs."

Asked whether basic scientific information should be submitted to the Chief of Staff before release, General Groves answered that policy decisions alone should be so submitted. The Smyth report was written on the basis of one page of rules. "Essentially they were that it could not contain anything that was not already known beforehand, and it gave certain exceptions." These exceptions were things which "men like Hahn or Heisenberg could get the answer once knowing the bomb had gone off," and "things that we knew could not be kept secret over ten minutes after the bomb was off."

General Groves added that, "I read the report. There were some things in there that I couldn't have told whether they met the rules or not, but in each instance a necessary check was made."

General Groves said that he is "90% in favor" of the recommendation of the Tolman Committee for further release of "what is properly termed basic scientific information—things that we learn which have no effect on national defense."

He stated that he knows "of no way" for "this weapon to be inspected internationally" but that he has appointed a committee of nine "which contains three or nearer five who are very much in favor of international control," "to come up with a plan that is scientifically and militarily possible." They are supposed to have the report to us by March 8." It will be made available to the Senate Committee "as soon as I have read it, to see if there is anything that requires further study."

General Groves insisted that he "believes thoroughly in freedom of research," but that "until other nations are willing to join us in reciprocal arrangements, we cannot afford to give

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Sec'y of War Patterson Favors the McMahon Bill - With Amendments

The May-Johnson Bill. Long before the bombs were dropped it was realized that there were unmeasured possibilities in the development of atomic energy for peacetime purposes as well as a war weapon. In May, 1945, Secretary Stimson formed a committee to consider the subject and to recommend legislation. Legislation was drafted under the direction of this committee, the bill being later introduced as the May-Johnson Bill.

The actual draftsmen were Captain Davis, Mr. Marbury, Baltimore lawyer then in the employ of the War Department, and Undersecretary Royall, then a Brigadier General.

The May-Johnson bill provided for a civilian Atomic Energy Commission, to take over and manage all source materials of atomic energy, all stock-piles of materials and all plants. It was provided that the Commission interfere as little as possible with private research. The Commission was given power to adopt the necessary security regulations.

The House Military Affairs Committee held hearings on the bill. It was freely criticized as a measure drafted by the military and intended to perpetuate military control of atomic energy. The House Committee, after adding several amendments further emphasizing freedom of research reported the bill favorably.

The President, since introduction of the May-Johnson bill, has indicated that he is of the opinion that a number of changes should be made in it. The War Department will, of course, advocate such changes in discussion of any detailed legislation.

War Department for International Control. It was realized by the War Department that the means of producing the atomic bomb would not forever remain the exclusive property of the United States. Secretary Stimson was one of the first to recommend a policy of international control of atomic energy, with a view to outlawing its utilization in war and fostering world-wide exchange of information. I have been and still am of the same opinion as Secretary Stimson.

I understand that the Secretary of State, with the aid of some advisors, is now considering what measures should be advocated by our representatives on the Atomic Energy Commission. I don't think the work of that committee has yet been completed. They are still meeting, I think.

For lack of a defined national policy, the organization that was built up during the war is disintegrating.

Senator Millikin: Mr. Secretary, do you appreciate the difficulty in the finding of a national policy until we have some information as to what the international policy may be?

Secretary Patterson: I think we have to go ahead with the adoption of legislation for national policy, bearing in mind the consideration that at all times it must be in step with international policy.

Senator Millikin: Well, you would not say it should be in step with international policy if from a national policy standpoint we considered that international policy did not properly protect our own security?

Secretary Pattersn: I cannot conceive of our being a part to international arrangements that the executive and legislative branches of the Government did not agree with.

The sooner we establish domestic policy and an organization to carry out that policy and gain experience under peacetime conditions in supervising and controlling this field at home, the sooner we can help effectively to lead the way in shaping any international system.

Atomic Energy Must Be Under Civilian Control. Only be a vigorous program of research and application can we hope to advance adequately this new science. At present, the War Department has full control over the entire field. Continuation of this situation is not calculated to advance fully the research and development of peacetime uses of atomic energy, for it is not the primary mission of the War Department to do so.

It has been the policy of the War Department since last September that this project should be turned over to a civilian agency. There has been no disposition whatsoever on the part of the War Department to keep control of the project.

Government Must Own Fissionable Materials and Control Source Materials. The War Department is in accord with the policies outlined by the President in his letter to Senator McMahon:

(1) A civilian commission for control of atomic energy, a three-man group devoting full time to the activity; (2) government ownership of fissionable materials.

Senator Millikin: Do you believe the Government should own material in the ground?

Secretary Patterson: The Government should have full power to acquire the ore in the ground and to explore for it, and own all source materials so mined, as well as fissionable materials.

Senator Millikin: I suggest that would be very impractical. We have had testimony be the Vanadium people, who point out how intimately associated uranium ores are with other ores. If because there happened to be uranium in any ore it came under the threat of Government ownership, we would have a very devastating effect on the development of our mineral resources.

Secretary Patterson: I don't mean automatic ownership, but full power to acquire either by purchase or condemnation the ores in the ground.

Senator Millikin: You would have to buy several of our States and parts of ten or twelve others, because the ores have a trace of uranium.

Secretary Patterson: I think a practical formula for that could be worked out that would exclude matters of the extent that you mention.

I was speaking of the points covered in the President's letter of February 1.

(3) Availability of devices utilizing atomic energy by means of compulsory non-exclusive licenses.

(4) Adequate provision for independent research and development.

(5) Ultimate use of atomic energy for exclusively peaceful ends, by means of safe, effective, international arrangement.

War Department Now for Full-Time Commission

Senator Hart: The May-Johnson bill sets forth one method and now you say that the War Department advocates a three-man group devoting full time to the activity. Is it your feeling that the Government can acquire the full-time services of three men who are fully competent to be charged with that highly important activity?

Secretary Patterson: I believe so. Initially we advocated a nine-man board as provided in the May-Johnson bill, not to be full time people. The matter was discussed in the Office of War Mobilization with quite a number of executive agencies represented, and also with the President, and the preference of the President was for a three-man group full time. The War Department is in accord with the decision. I believe that the commission would find it advisable to have an executive manager, call him what you may, to handle the administrative matters.

Favors Civilian Control Independently of World Political Situation.

Senator Millikin: Am I correct in assuming, Mr. Secretary, that your recommendation that the matter be turned over to a civilian commission is pre-

mised on whether Congress reaches the conclusion that the world is really postured for peace?

Secretary Patterson: I think that the development of it should be handled as an entity, and that the military aspects of it should be handled as an entity, and that the military aspects of it can perfectly well be taken care of by virtue of provisions in your Act insuring that the military development be carried on by the commission in close co-operation with the armed forces.

Senator Millikin: As to the civilian usefulness of it, we have had testimony that divides the usefulness in roughly two categories, one for power, and the other for medicinal purposes. But we need not push forward in those fields. I suggest, as long as the overriding consideration has to do with the energy as a military weapon, could we not lock the whole thing up, if security required it, for a year or two years without damaging our peace time life in any material respect?

Secretary Patterson: I do not think it is necessary at all that the national defense would suffer by the turning over of that to a civilian agency under proper safeguards.

The Chairman: Does it occur to you that the fact that we might turn this over to a civilian commission would in itself have anything to do with "posturing the world for peace?"

Secretary Patterson: Yes, it might. I think the turning over of this project to a new civilian agency is in line with our national policy to promote world peace.

The Chairman: I believe there is hardly any weapon of war that doesn't find its basis now in electricity. There might be some argument that all electricity in the country should be turned over to the War Department for its safekeeping.

Senator Millikin: I think the Chairman's question to you, Mr. Secretary, carries clearly a theory that we can get peace by gestures; that we can get peace by giving a civilian aspect to our most powerful weapon.

I suggest that if that is a useful gesture, then we cannot escape making the same gesture as to our lesser weapons, to-wit, the Navy, and the Army, and the Air Force.

Secretary Paterson: I hope that the day is not distant when international controls for elimination of atomic weapons as instruments of war, together with effective safeguards to insure compliance by all nations, can be devised and put into operation, under auspices of the United Nations. In the interval we are faced with the fact that the atomic bomb is the most potent weapon of war yet devised by man.

Army Should Participate in Military Applications

S. 1717 contains a recognition of the military aspect of atomic power. Section 6 provides that the commission shall do research and development in the military applications, shall have custody of all atomic bombs, and may produce them in the future to the extent directed by the President.

The War Department cannot subscribe to these provisions which virtually exclude the armed services from all phases of military application of atomic energy. The Army and Navy would be utter strangers to what was going on, although they might be called on to operate the weapons so developed.

The War and Navy Departments are charged with responsibility for the national defense. Unless it is proposed to relieve them of this responsibility, provision should be made for their activity, in conjunction with the commission, in the military part of this field. The War Department will submit specific provisions along this line.

Wants Army Custody of Atomic Bombs. The War Department is also concerned about the provision that the Commission is to have custody of all atomic bombs. The War Department urges that the stock of atomic bomb components should remain in the hands of the military forces.

It is of great importance that as much information as can be made available without prejudice to the national safety should be freely circulated. At the same time it is of vital importance that adequate means be provided for holding information secure where release would be prejudicial to the national safety. In determining what information would endanger national safety, common prudence requires that the armed forces should be consulted. The announced policy of the United States is that the technical secrets of atomic bomb manufacture should be held secure. Security provisions of domestic legislation should reflect this policy.

Believes Espionage Act Inadequate

S. 1717 places reliance on the Espionage Act. The Espionage Act is inadequate. It does not prohibit the transmission of military information even by government employees unless subversive intent can be shown; nor does it prohibit the communication of information of military value that is developed by private persons.

The Chairman: What law protects developments in radar or bombsights?

Secretary Patterson: The Espionage Act is doubtless the Act that is most relevant, but careful reading of the Espionage Act shows that not all the communications of information of importance to the national defense is covered by it. In time of actual war of course there is a fairly broad provision in the Espionage Act, the concluding provision. However, it is hard to find anywhere in the Espionage Act anything dealing with disclosure of information unless it is with actual intent or reason to believe that it will injure the nation because certainly the first five clauses of it are all qualified with the existence of that intent.

The Chairman: Wouldn't it be better to try to design a general statute to cover all military information rather than to work it out on this particular problem? Wouldn't it be well, Mr. Secretary, if the War Department was to recommend to the Congress amendments to the Espionage Act?

Secretary Patterson: I would put it right in the measure itself, and would give the commission authority to adopt regulations in line with the general policy of having the freest possible circulation of information.

Senator Austin: I think the Secretary's attitude in the matter is justified by the history of attempts to tighten up the Espionage Act.

Secretary Patterson: As I read the Espionage Act, each division of it deals with a specific case. They are a series of specific provisions against particular things, and for most of them you have to prove the intent.

The Chairman: Which is a pretty sound protection of the Anglo-Saxon system.

Secretary Patterson: I quite agree, Senator. It is all a question of how important you see it.

Take the technique of the actual bomb manufacture, for instance. The commission ought to have the fullest power to protect that information. If anybody just saw fit to exercise free speach about it, is it thought for a minute that that should be done?

The Chairman: Now aren't there other fields in which it is just as important?

Secretary Patterson: No, sir; not as important as this weapon that I know of.

Basic scientific information should be freely disseminated but the commission should be empowered to define what is included in this concept, having due regard for the national interest.

The Chairman: You mean the commission should decide what is basic scientific information?

Secretary Patterson: I think they should outline the boundaries of it.

The Chairman: Do you advocate any veto power by the military as to what constitutes basic scientific information?

Secretary Patterson: No, sir.

The Chairman: Do you contemplate that the commission, before releasing basic scientific information, should submit it to the War Department for its review?

Secretary Patterson: I see no harm whatsoever in having consultation before that, but the matter should be in the power of the Commission, subject to approval by the President.

I think the Commission should, of course, consult on a matter of that sort with the Army and Navy to get their ideas, but not to be bound, however, by what they say.

The part about this bill that concerns me is the exclusion from every consultation of the people who are responsible

(Continued on next page)

CONGRESSIONAL NEWS

Sec'y Patterson for McMahon Bill -- With Amendments

(Continued from page 7)

for the national defense—even from consultation.

The Chairman: There is a Division of Military Application, Mr. Secretary.

Secretary Patterson: But it doesn't mention anywhere any contact with the War Department or Navy Department. There is nothing there to suggest that the Division would have any speaking acquaintance with anyone in the War Department or Navy Department.

I appreciate the concern that is felt by people in excessive security regulations, and you have got the two interests that I think anyone who studies it must concede exists: A policy of the freest dissemination possible in order to exploit any possibilities of this power, and, at the same time, certain facts that must be protected by security regulations. I know of no better way than to vest it in the commission.

The Chairman: Do you think that there is any possibility that this country might weaken its national defense if it set up air tight secrecy restrictions on the dissemination of scientific information?

Secretary Patterson: I can imagine no useful purpose to be served by revelation of the technique of bomb manufacture. I can imagine very harmful effects from it, extremely harmful, and I can imagine nothing useful.

The Chairman: But I can also see, Mr. Secretary, considerable harm that might come to scientific progress by a continuation of the Manhattan District's philosophy as to the security.

I can see, from talking with the scientists, many of them who furnished the essential ideas under which this as made, that they will not continue under the same kind of secrecy restrictions as they did in wartime.

Secretary Patterson: Of course, I am interested in their views on it. They are of value.

Conclusions

In conclusion, the War Department stands with those who desire the establishment of a sound and effective national policy for the development of atomic energy geared to the highest interests of the nation and of the world. Knowledge in this field must be greatly expanded, and to this end the War Department favors minimum interference with independent fundamental research consistent with requirements of national safety. We are convinced, however, that until such time as international arrangements and safeguards to make this goal effective have been worked out, stage by stage, legislation relative to atomic energy should make provision that the War and Navy Departments be consulted and take part in those phases of atomic energy relating to military application. We are also convinced that the power of the commission to adopt adequate regulations for protection of information vital to the national defense should be stated in terms that admit of no doubt or debate. We urge that S. 1717 be amended to cover these essential matters.

SECRECY IN SCIENCE

L. N. Ridenour

(Continued from page 3)

such as that we are in today, even in the war to which such an armaments race is likely to lead us, how do we benefit by withholding the results of such investigations in medical fields?

It is my opinion that all of the atomic energy control bills so far presented go much too far in imposing restriction. There would be little purpose served by full publication of instructions for the manufacture of an atomic bomb, and I believe that it is wise to restrict the publication of information concerning finished military devices. On the other hand, there is no benefit to us, and there can be very serious harm, in restricting the performance of experiments or the publication of results in any field of basic science, nuclear physics included. The definition of "basic scientific information" in S-1717 is too narrow. It is important to publish not only the end results of scientific work, but a detailed description of how they were obtained. It is only this practice which distinguishes modern science from medieval alchemy.

We can make an analogy with the way other weapons are handled. The design of guns is kept confidential; yet the metallurgy of steel is dealt with in the usual way. Military aircraft are designed in secret; yet the aerodynamic principles on which they are based, and even techniques such as flush riveting, are freely published and available to all. It is thus that scientific and engineering progress is made.

Advocates of secrecy in science feel that it will advance our national security and strengthen our national defense, else they would not advocate it. All of the evidence available to me shows that scientific discovery and engineering development cannot flourish fully except under conditions which allow all competent men to be fully informed, and thus able to contribute to progress. We shall weaken, not strengthen, our national defense by any restrictive measures on performance or on publication in scientific fields.

GEN. GROVES STATES HIS VIEWS

(Continued from page 5)

any essential part of information we have until such time as we are assured that it will not be used against us."

Asked by Sen. McMahon whether security regulations, whose violation would be criminal acts, should have the approval of the President, General Groves replied that—"I would just hate to see anything more thrown on the President than he has to have"—to which Sen. McMahon retorted that he'd rather try to remove from the President some matters "which do not affect the life and liberty of our citizens."

At this point, Sen. Millikin accused General Groves of advocating turning over the control of a most important military weapon to a civilian commission. He asked General Groves whether such a commission should have the right to tell the military forces "how many bomb to make, how to make them, where to keep them or what to do with them." General Groves answered that all policy decisions should be confirmed by the Chiefs of Staff.

Turning from the Commission to the Administrator, General Groves said this was "the primary place where active officers are apt to be used." Describing the duties of the Administrator, he classified them as (a) running the existing organization and (b) handling outside contacts. For example, if a university wants enriched material, he would investigate whether they meet our policy requirements on security and whether they will really put some efforts into this thing and not just to say, 'We, too, have a department in nuclear physics'. Asked by Sen. Hickenlooper whether such screening would be compatible with freedom of research, Gen. Groves answered that "before the commission gives them material, they should meet requirements that will ensure the best interest of the United States."

He also said that "if someone should achieve getting atomic energy out of a common element, I don't believe that should be published." He described Argonne Laboratory as an example of a place which "will be put on the basis of free and open research," but where "if we decide that certain work should be secret, we will have the right to ask the man to continue on a secret basis or abandon the work and turn it over to us." He insisted that "despite what you read in the papers" "the Army had cooperation and good feeling in all the laboratories."

Answering a question of Sen. Hickenlooper, Gen. Groves said that compartmentalization "decreases perhaps in some instance the ability of a scientist to do his best," but "in this case the military security overrides that" and "he has got to get along without some knowledge or to find it in some other way."

poses of confirmation should be repeated at irregular periods.

Should any large mine prove of importance as a source of radioactive material it would become subject to the type of inspection provided for producing mines.

DETECTION OF NEW DISCOVERIES

The goal of a program of regional inspection is to obtain prompt information concerning the location and magnitude of any new uranium or thorium deposit as soon as possible after discovery. When a discovery offers promise of becoming a mine an inspection program would be started.

The methods that may be utilized would provide rigorous inspection with a comparatively small personnel. If such methods are studied with care and applied on a world wide scale, the acceptance of the program by the countries most concerned would be a strong indication of cooperation. Should any nation accept such a program yet later undertake a campaign of obstruction it is unlikely that such a policy would escape notice.

A nation would need to be willing to have representatives of an outside international organization go from place to place, visit mines as requested and carry on tests for uranium and thorium anywhere from the largest mine to the most remote prospect. Portions of files of government agencies and private companies applying to sources of raw materials should be available to properly authorized inspectors.

Inspection would be greatly aided if commercial incentive can be established in such a way that prospectors find it more profitable to dispose of radioactive minerals to the international organization than elsewhere.

In regions where all title to mineral deposits is vested in the state the possibility of establishing incentive aid will depend upon state agreements. This would probably mean that within the domain of prospecting for uranium and thorium the authority of the international commission would need to be greater than that of the state itself. This could become a major problem in negotiations with highly nationalized states.

Inspection may be greatly simplified if the only organization authorized to purchase uranium and thorium ores is an international inspection organization.

Under such an arrangement all operators producing uranium or thorium ores would presumably do so under license of the United Nations Organization.

DETECTION OF EVASION

One of the problems that frequently arises in any discussion of inspection is that of presumed active or passive obstruction. However, it would seem likely, that, having granted permission for inspectors to visit all mines, to look at any geological occurrence of interest, to require regular reports on all discoveries, to make maps, to conduct aerial surveys where necessary for purposes of inspection, to conduct an aerial reconnaissance, and to buy and sell all uranium and thorium ores, little actual opportunity would remain for obstruction. If obstruction did exist, it would hardly remain unknown for long.

Aerial surveys now make possible the rapid assembly of data covering the location of mineral deposits for large sections of the earth's surface. Mines are easily visible from the air and the roads leading away from mines are usually well travelled. Under normal circumstances a combination of aerial reconnaissance and surface exploration should reveal the presence of any mine of consequence.

One of the points that frequently arises in considering the problem of locating new discoveries is the possibility that a country which wishes to evade inspection, will find a new deposit of uranium or thorium in some remote locality, and will conceal a new mine through the use of camouflage.

Through the cooperation of Col. Homer St. Gaudens, who was active in camouflage work during the war, the Committee learned that the detection of camouflage has reached an advanced state of development not ordinarily appreciated.

The key element in the detection of camouflage is a suspicion that in some area evasion is being attempted. If suspicion exists, although the area that must be inspected to find a hidden mine may cover as much as a hundred square miles, it is possible to accomplish detection. The most effective method that can be employed in this detection is aerial photography.

In peace time the mere existence of a camouflage project would arouse suspicion. If the photographic plane is able to fly low, to circle and to photograph at will detection from the air becomes highly efficient.

Through the war the Military Geology Unit of the United States Geological Survey cooperated with the army in the study of terrain in enemy country. Maps of enemy country showing the distribution of the types of rock exposed at the surface, and many geological features were prepared.

It would seem likely that the technique utilized by the Military Geology Unit could be applied to advantage as one phase of international inspection.

The total personnel that would be required for the detection of new discoveries depends upon the privileges and authority of the inspecting organization. However, where types of inspection, which might form a part of the general inspection program have been attempted, the numbers involved have been comparatively small. It is easily possible that a group totaling not more than several hundred might be able to develop and successfully apply an international inspection system.

SUGGESTED PROGRAM

The first phase in inaugurating an inspection program would be an international review of all published data and all confidential files on the distribution and amounts of raw materials. Each country should be required to supply all pertinent data.

The second phase would involve:

(a) visits to all producing mines by an international commission.

(b) an international survey of potentially productive areas revealed under phase one.

(c) confirmation of data on raw materials previously produced. This would be assentially an inventory of materials above ground.

It is assumed that the two phases would be followed by the inauguration of an inspection program to apply both to raw materials and manufacturing. Inspection should be established on a working basis before those nations holding the technical secrets of the atomic bomb would be expected to make complete revelation.

CONCLUSION

The Committee concludes that technical control of raw materials is sufficiently feasible to justify a serious attempt to establish a control system. The system established should include inspection at known mines, by-product inspection, and a detection program for new discoveries.

Inspection at known mines could be carried on with a comparatively small personnel and could be made highly effective. By-product inspection would need to be established on a periodic basis in order to bring all mines with a small radioactive by-product within the inspection network. The detection of new discoveries provides the most troublesome problem of all raw materials inspection. It could become effective if supported by a formidable series of rights and privileges.

The most important feature in inspection is to make certain that every device, not only technical, but economic and political as well, shall be provided to furnish the foundation upon which inspection can operate. Granted such a foundation, the Committee feels that a competent technical organization, with adequate field facilities and suitable laboratories, could establish a highly efficient world wide raw materials inspection for uranium and thorium. The personnel involved would not be too large, and the facilities required would be modest, in contrast to the importance of the undertaking.

SCIENTISTS IN WAR AND PEACE . . . Edward Teller

The atomic bomb is in its earliest infancy and even a moderate amount of work may improve it considerably. Future bombs may become less expensive, may be easier to handle and they may have a much greater destructive power.

I do not know whether international developments will make further work on atomic bombs necessary. I share the hope that the atomic bomb together with other weapons of aggression will be eliminated. But if it should be necessary for us to proceed with the development of the atomic bomb it must be pointed out that, under present conditions, this is hardly possible.

Among the peace-time applications, extraction of useful power from chain reacting structures will have the greatest economic significance. One must not expect any profound effects on our economic life, but specific applications may be important. One is the production of energy in places which cannot now be cheaply supplied. Another is construction of smaller energy-producing units which will keep working for a very long period of time. Progress towards all these ends has been in the recent past slow.

Use of radio-elements which are by-products of atomic power plants will have an extremely great influence in science, particularly in medical science. It will lead to a better understanding of live organisms, and cannot fail in the end to be an instrument in saving many human lives. Progress in this direction has been so far practically negligible. Distribution of these elements would disclose no further secret and would result in no real danger since in small quantities these by-products are harmless. The only reason why the by-products have not been so far distributed and used is due to the inertia of the administrative apparatus. I believe that these materials should be made available not only to scientists in this country but to scientists throughout the world.

Scientific use of by-products will probably not be long delayed. All other phases of work on atomic power present a much more serious problem. This is due to the fact that scientists are returning to their academic work and the great majority of them has stopped being actively interested in further developments of a practical nature. During the war-time emergency everybody knew that a job of extreme importance had to be accomplished. Now that the immediate danger has passed most scientists decline to do further work on war projects. There are several reasons for this.

Scientists are men who have chosen as their work the free investigation of nature. For this freedom they have sacrificed the expectation of a greater income which industrial or commercial jobs offer. They will not sacrifice this freedom except for the most compelling reasons.

In times of peace many feel an understandable reluctance to work on weapons of destruction.

With the success of the atomic bomb a number of routine operations have become part of the program. In Los Alamos, these routine operations threaten to crowd out research and development. Under such conditions it is extremely difficult to secure the cooperation of scientific personnel.

The development of atomic power and the production of the atomic bomb were possible only because individual scientists were willing to take the initiative and to assume responsibility. According to the nature of the organization in which we were working, and which continues to be in force, such individual actions were not encouraged and often met with resistance. Since the emergency has passed, few scientists are willing to bear such a burden.

What can be done to induce a reasonable number of scientists to work on the further development of atomic power?

First, it is important that legislation should be passed to make long-term planning possible and thus remove some of the handicaps. **But wrong kind of legislation will merely cause the present stagnant conditions to continue.**

It must be clear that no kind of pressure can bring about real progress in science. It is impossible to force a person to be inventive and resourceful.

Mere financial inducement will not suffice either, and congress can not insure progress by simply appropriating great sums of money. One of my young friends has recently accepted a stipend of $150 per month because this stipend permits him to continue his studies and his research. In doing so, he turned down a job with a salary almost six times larger. A certain amount of money will of course be necessary. But other conditions are not less important.

One of these is the removal of certain secrecy regulations. Purely scientific data; i. e., facts concerning natural phenomona, must not be kept secret. If such secrecy is continued it will warp the entire research activity of any man who is involved in work on atomic power. He either has to sever relations with the scientific world not involved in the development of atomic power or he has to acquire a split personality, remembering in certain parts of his work only certain parts of the information available to him.

Furthermore, scientific facts cannot be kept secret for any length of time. If we attempt to keep scientific facts secret, it will certainly hinder us, but will hardly interfere with the work of a potential competitor.

The only secrets which can remain effective for a reasonable length of time are technical details of construction and industrial know-how. Indeed, these things cannot be easily communicated except by actual collaboration. As an example, I may mention the construction of cyclotrons. In spite of the fact that full details have been published, everyone had the greatest difficulties in reproducing these instruments except those men who had a chance to learn directly from the original inventors.

Another part of security regulations which will impede progress is compartmentalization. During the work on the atomic bomb, an attempt was made to give each person only so much information as he needed to perform his specific task. Thus the field of vision of each individual was artificially narrowed down. He could not use his full imagination. He could not be fully useful. One great drawback in this system is that in scientific work no person can judge what information another man will need. Scientific work is a continual search for surprises. It can be taught, but it cannot be planned or directed. Compartmentalization is the principle that your right hand not know what your left hand is doing. In the long run this principle makes effective research impossible.

I believe that even if some secrecy must be maintained, it should be restricted to a few technical details. Secrecy regulations should be in a large measure entrusted to the people who themselves engage in the work. And finally, everyone who is judged to be capable of original contributions and who is working on the technical development of atomic power should be authorized to receive information in the entire field. One should withold information from a scientific worker only if one has reason not to trust him. In that case, of course, he should be given no information whatsoever.

The Bills of Senator McMahon and Senator Ball contain provisions to exempt scientific information from secrecy. It would be a further great improvement if the law would contain a provision against compartmentalization of technical information.

Perhaps the most important requirement for successful scientific work is the encouragement of individual initiative. In organizing work on atomic power there exists the grave danger of too much planning, of too great centralization. Thus a mistaken idea, a single scientific prejudice in the minds of the planners may render the whole program barren. Such vigorous planning will, furthermore, repel the best scientific talent.

This danger cannot be avoided by good legislation but only by a reasonable administration of the law. But legislation may act to prevent overcentralization by earmarking a yearly sum for small projects, carried out at universities. These projects should not be under the

(Continued on next page)

I.C.C. Rally Backs Civilian Control of Atomic Energy

A mass rally was held in Orchestra Hall on February 25 under the auspicies of the Independent Citizens' Committee of the Arts, Sciences and Professions. It drew a capacity audience of over 2500, which unanimously passed a resolution indorsing the McMahon bill.

Harold Urey pointed out that it is impossible to expect the Army to understand that freedom of thought is the lifeblood of science.

Harlow Shapley talked about his visit to Soviet Russia last summer. "My talks with Russian scientists made me realize more imperatively than ever the importance of international cooperation if we are to solve the problem of war and the atomic bomb. Russian scientists, like American scientists, recognize that one of the problems which must be solved in the near future is the enrichment of international relationships."

"We in the United States, seem to be far ahead in most scientific fields. Our leadership is commonly recognized by Russian scientists. They frankly plan to follow our lead—eventually to equal our successes and progress and to profit from our mistakes.

"I do not intend to imply that the Russian scientists are trailing all along the line. In the fields of plant physiology and ecology, the Russians have done first-class work. The modern science of the soil was originated in Russia. The Pavlov Institute has long carried on most revealing studies of the nervous system. Current Russian mathematics stands very high and in some departments is not excelled in the world.

"With their two great observatories destroyed completely and some others badly damaged, it is not surprising that now two or three American observatories each have more equipment, and possibly more active personnel than you will find in all of Russia at this time. But this inequality is temporary.

"A century ago, the observatory at Poulkova near Leningrad, was the astronomical capital of the world. When in Leningrad, we visited the sad site of the Poulkova Observatory. That hilltop now is a tragic mess. Only some battered walls are standing—precariously.

"If you can visualize that awful waste I saw on Poulkova Hill, the wreckage of scientific equipment, gathered and used for reseach that has enriched your lives and mine as well as that of the Russians—and then—in your mind's eye, extend that war waste over a large area, you will have a dim impression of the devastation of atomic bombing.

"Should man and all that man has accomplished wither in the atomic fires just because we have no adroitness in international relations?

"The alternative is for the policy-makers of the great nations to recognize that the planet is too small for competing nationalities. This is not a matter of partisan policies. This is an issue for independent citizens—for independent thinkers—and the time is now."

Senator Tobey was unable to attend. Following are quotations from his prepared speech:

"All of us realize that the United Nations Organization, as adopted, is not just what we would have liked, but it was the best we could get. We recognize the gross weakness that exists in this organization by virtue of the veto power. We aim to correct this by amendment, as soon as possible.

"No nation has heretofore been willing to give up sufficient of its national sovereignty to set up World Government. The first change in this attitude came in Eden's recent statement, supplement by Bevin's plea for World Government.

"Perhaps you feel as I do that the Assembly itself should be the dominating body—the Assembly which gives representation to small nations as well as great.

"There has never been a time when the Congress has had more complicated problems to face, both domestic and international. But suddenly, with the dropping of the first atomic bomb, there was presented a problem transcending anything in the history of the world.

"Once let other nations be convinced that we have adopted a policy of secretely developing nuclear science for military purposes, and that would leave no alternative but to follow suit as quickly as possible, and we would have a diplomacy of fear ruling international matters."

The closing speaker was Congresswoman **Helen Gahagan Douglas.**

"Traveling in and out of Washington at the present time is a group of serious, thoughtful men. They are not subsidized by any political or economic group. And, strangely enough, they are not seeking anything individually for themselves.

"Who are these people? The foremost scientists of the day.

"What are they trying to do? Trying to save us from ourselves!

"Are we going to listen to the only men who have the facts? Or are we going to lull ourselves into eternal sleep with soothing syrup passed out by local, national, or international medicine men?"

In introducing the resolution to urge the passage of the McMahon bill, **Dr. Gustavson** said:

"The appalling lethargy which has overtaken too many people on the problem of world peace is the most critical condition we have to fight today.

"The McMahon Bill is based on the assumption that we will have international understanding on atomic energy. It protects everything of a military character but allows research to continue.

"For these reasons, scientists believe the McMahon Bill to be the child of careful thought and determination for the future of mankind without wars, whereas the May-Johnson Bill is based on the notion that there is no escape from wars."

SCIENTISTS IN WAR AND PEACE

(Continued from page 10)

direction of the central administration of atomic power. They should be responsible to the faculties of the respective universities. Their success should be judged after three or five years. If even one percent of the money spent on atomic power would be set aside for such long-range investments, we could be assured of valuable returns.

To obtain a picture of the way in which scientists could most effectively participate in future work on atomic power, the problem should be considered under five headings:

1) **Work on general scientific background and on education.** Scientists are most eager to engage in this work. If the traditional freedom of research is preserved and if some financial aid is given, this type of work will flourish.
2) **Work on technical peace-time developments.** One should attempt to carry out a considerable part of such work at universities but only under the condition that the work need not be kept secret. In this way universities will remain institutions of free learning and enquiry.
3) **Development of weapons.** If this activity is judged necessary, it should be carried out in the most effective way. This means that secrecy should be reduced to a minimum. As much as possible of the work not subject to secrecy should also be carried out at universities. The rest must be done at special laboratories with participation of full-time and part-time scientists. To secure the necessary scientific personnel for this work in peacetime will be difficult. The special laboratories must have, therefore, an exceptionally wise and liberal leadership.
4) **Production of weapons.** This work will never attract scientists and in the long run scientists are not needed in this work. The work should be transferred to the armed forces and placed under the direct authority of the President of the United States.
5) **Testing of weapons.** This activity is of great interest to the armed forces and for the scientists as well. An atomic bomb may be regarded as a scientific tool. It allows us to find out facts of nature which cannot be found out in any other way. These tests cannot be effectively performed either by the armed forces alone or by the scientists alone. Tests should be planned mainly by scientists, but in the actual execution the armed forces should participate to the greatest possible extent.

"One World or None" To Be Issued Soon

Publication date for ONE WORLD OR NONE, a Report to the Public on the Full Meaning of the Atomic Bomb, has been set for March 18 by Whittlesey House, a division of the McGraw Hill Book Company. Whittlesey House considers the book its most important in its 15 years of publishing and in order to make the book available to the widest possible market has departed from a long established policy and will issue the book in a paper binding at $1.00. A cloth bound edition at $2.00 will follow later.

Chapters have been written by authorities from the project and from political and military fields. Following is a list of the chapter titles with the authors:

Introduction .....Arthur H. Compton
Foreword: Science and Civilization ....
.....Niels Bohr
Hiroshima & New York--Philip Morrison
Atomic Energy in the Stars.....
.....Harlow Shapley
Roots of the Atomic Age....E. P. Wigner
The New Power .....Gale Young
The New Weapon....J. R. Oppenheimer
Air Force in the Atomic Age.....
Gen. H. H. Arnold
There is No Defense....Louis N. Ridenour
Bomb in the Basement.....E. U. Condon
Other Countries Can do It.....
.....Frederick Seitz and Hans Bethe
An Atomic Armaments Race and
Its Alternatives .....Irving Langmuir
What It All Adds Up To.....H. C. Urey
Can We Avert An Arms Race by on
Inspection System.....Leo Szilard
The International Control of Atomic
Energy .....Walter Lippmann
The Way Out .....Albert Einstein
Survival is at Stake....Federation of American (Atomic) Scientists

The book was edited by Dexter Masters of the McGraw Hill Company and Katharine Way of the Metallurgical Laboratory. The first printing will be 100,000 copies. It is hoped, of course, that it will have a very wide distribution and be a real help in bringing to the public not only the facts but also implications of the bomb and that it will help to arouse the feeling that wide discussion of our possible national and international policies is needed urgently.

SENATE COMMITTEE PREPARES BILL

(Continued from page 1)

kept secret; this line he wants drawn by the civilian commission.

The amendments which Patterson suggested, would give the Armed Forces the right to conduct military research in the field of atomic power, to have the custody of atomic bombs and to be consulted on security regulations.

In addition to the McMahon bill and the suggestions of Patterson, the Senate Committee takes with it, into its executive session, the knowledge of strained relations with Russia and consequent scepticism as to the success of international cooperation; ugly rumors of impending wars; real and fabricated spy-scares and the resultant poisonous fog of suspicion.

Can we hope that in this atmosphere, the Senate Committee will write a wise and enlightened bill, looking forward to international cooperation and peaceful development of atomic energy? Is the Committee likely to realize, under these unhappy conditions, that even in the case of an armament race, the best hope for this country lies in maximum development of creative research, and not in its stifling by military rule, secrecy and compartmentalization?

After spending several days in executive session, the Committee re-emerged to listen to a last admonition by General Groves. In opposition to the Commander-in-Chief, and to the Secretary of War, General Groves presented his personal views. The program of military dictatorship over science, which lay concealed in the May-Johnson bill, was boldly outlined by him. He suggested a part-time, nine-man Atomic Energy Commission, containing up to four military men—a Commission from which all competent scientists are to be barred because they are "not disinterested." He would like to see an officer on active duty as the Administrator. As a desirable pattern for the relation between the commission and the administrator he outlined the war-time relation between himself and the Military Policy Committee—in which, according to his own words, "he was himself both the Commissioner and Administration."

This is a program to drive away the best scientists in the country—who will feel that their efforts will be wasted by working under these conditions. They will choose other fields to work in—not for reasons of personal convenience but because they will be certain that in this way they can make a greater contribution to the progress of science and national welfare.

To the military mind, one scientist may be as good as another; if one leaves he can be replaced by another one. This is the spirit in which Hitler let the best German scientists leave the country. He thought that he could find adequate replacement among servile nonentities with party membership cards. This is the spirit which dryed out military research in this country between the two World Wars.

The decision now before the Senate Committee, and soon before the Congress as a whole, is of tremendous import. Will the Congress, in despair over the momentary—and perhaps passing—international troubles, enact legislation which will create, in the tissue of our public life, a malignant tumor of irresponsible military rule; which will stifle science in the name of a futile 'security', create a "Maginot line" of a stock of atomic bombs, and start the whole world on the road to disaster?

"Look" Publishes Pictorial Summary of Atomic Bomb

Look, March 5, Editorial Staff: "Your Last Chance to Avoid Atomic Destriction." A fifteen-page pictorial article—depicting destruction which a bomb will cause in an American city, the folly of a militaristic "solution" of conquering and policing the world, the horror of living in a world where atomic bombs may fall at any hour, the devaluation of property and desolation caused by dispersal of cities. Direct appeal to teachers, clergymen, salesmen, real estate men, newspapermen, others to organize action among their professional groups for enlightenment on the dangers threatening them specifically, and organized action for the prevention of an atomic war.

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